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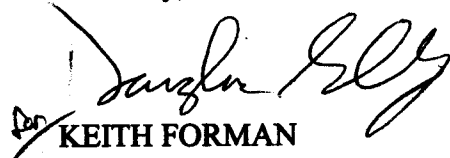
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Dear BCT Members:

Enclosed is the Final Removal Action Completion Report, IR-02 Northwest and Central Parcel E, at Hunters Point Shipyard, San Francisco, California, of December 12, 2007. Thank you for your comments on this report. The Final Response to Comments document is included as Appendix N.

If you have questions, please contact Ms. Sarah Penn at (619) 532-0962.

Sincerely,


KEITH FORMAN
BRAC Environmental Coordinator
By direction of the Director

Enclosure: (1) Final Removal Action Completion Report, IR-02 Northwest and Central Parcel E, at Hunters Point Shipyard, San Francisco, California, of December 12, 2007

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**FINAL
REMOVAL ACTION COMPLETION REPORT
December 12, 2007**

DCN: ECSD-5713-0072-0005

**INSTALLATION RESTORATION SITE 02 --
NORTHWEST AND CENTRAL
PARCEL E, HUNTERS POINT SHIPYARD
SAN FRANCISCO, CALIFORNIA**

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CONTRACT No. N68711-98-D-5713
CTO No. 0072

FINAL
REMOVAL ACTION COMPLETION REPORT
December 12, 2007

**INSTALLATION RESTORATION SITE 02 --
NORTHWEST AND CENTRAL
PARCEL E, HUNTERS POINT SHIPYARD
SAN FRANCISCO, CALIFORNIA**

DCN: ECSD-5713-0072-0005



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ABBREVIATIONS AND ACRONYMS

□□	beta
%R	percent recovery
□Ci	microcurie
□g/kg	micrograms per kilogram
AEC	Atomic Energy Commission
AM	Action Memorandum
BA	Biological Assessment
BART	Bay Area Rapid Transit
bgs	below ground surface
BMP	best management practice
BRAC	Base Realignment and Closure
C&T	Curtis and Tompkins, Ltd.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm	centimeter
COC	chemicals of concern
cpm	count per minute
¹³⁷ Cs	cesium-137
CTO	Contract Task Order
cy	cubic yard
DCGL	derived concentration guideline level
DGPS	Differential Global Positioning System
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DON	U.S. Department of the Navy
DQA	Data Quality Assessment
DQO	Data Quality Objectives
EPA	U.S. Environmental Protection Agency
EPP	Environmental Protection Plan
ESA	Endangered Species Act
EWI	Environmental Work Instruction
FCR	field change request

ABBREVIATIONS AND ACRONYMS

(Continued)

FWENC	Foster Wheeler Environmental Corporation
FS	Feasibility Study
HazCat	Hazardous Categorization
HPS	Hunters Point Shipyard
ICP	inductively coupled plasma
IN	inch
IR	Installation Restoration
J	estimated value
LLMW	low-level mixed waste
LLRW	low-level radioactive waste
m ²	square meter
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDA	minimum detectable activity
mg/L	milligram per liter
mil	thousands of an inch
MPPEH	material potentially presenting an explosive hazard
MS/MSD	matrix spike and matrix spike duplicates
msl	mean sea level
NAVFAC SW	Naval Facilities Engineering Command, Southwest
NAVSEA	Naval Sea Systems Command
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
pCi/g	picocurie per gram
PPE	personal protective equipment
ppt	parts per thousand
PRG	preliminary remediation goal
QA	quality assurance
QC	quality control

ABBREVIATIONS AND ACRONYMS

(Continued)

²²⁶ Ra	radium-226
RAB	Restoration Advisory Board
RACR	Removal Action Completion Report
RAO	Remedial Action Objective
RASO	Radiological Affairs Support Office
RCT	Radiological Control Technician
RI	Remedial Investigation
ROC	radionuclide of concern
ROICC	Resident Officer in Charge of Construction
RPD	relative percent difference
RPM	Remedial Project Manager
RRO	Radiological Remedial Objective
RSO	Radiation Safety Officer
SAP	Sampling and Analysis Plan
SCRS	Surface Confirmation Radiation Survey
SFRA	San Francisco Redevelopment Agency
SHSP	Site Health and Safety Plan
SOP	Standard Operating Procedure
⁹⁰ Sr	strontium-90
SVOC	semivolatile organic compound
SWPPP	Stormwater Pollution Prevention Plan
TCRA	Time-Critical Removal Action
TDS	total dissolved solids
TOG	total oil and grease
TPH	total petroleum hydrocarbons
TPH-d	quantified as diesel
TPH-extractable	total extractable petroleum hydrocarbons
TPH-g	quantified as gasoline
TPH-purgeable	total purgeable petroleum hydrocarbons
Triple A	Triple A Machine Shop, Inc.
TtEMI	Tetra Tech EM, Inc.

ABBREVIATIONS AND ACRONYMS

(Continued)

TtEC	Tetra Tech EC, Inc.
TtFW	Tetra Tech FW, Inc.
U	not detected
U&A	Uribe and Associates
UJ	estimated value at less than the laboratory reporting limit
UXO	unexploded ordnance
VOC	volatile organic compound
yd ²	square yard

EXECUTIVE SUMMARY

This Removal Action Completion Report describes the implementation of a time-critical removal action at Installation Restoration Site-02 Northwest and Central located within Parcel E at Hunters Point Shipyard, San Francisco, California. The Department of the Navy, Naval Facilities Engineering Command, Southwest, and the Radiological Affairs Support Office directed the removal action.

Hunters Point Shipyard is located on a long promontory in the southeastern portion of San Francisco that extends into San Francisco Bay. At the start of World War II, the Department of the Navy took possession of the property and operated it as a shipbuilding, repair, and maintenance facility until 1974, when the shipyard was deactivated. From 1976 to 1986, the Department of the Navy leased the property to a private ship repair company. When that company ceased operations, the Department of the Navy resumed occupancy through 1989. Since previous operations had left hazardous materials on site, Hunters Point Shipyard was placed on the National Priorities List in 1989 as a Superfund site.

Previous radiological investigations identified radium-226 contamination in soil at Installation Restoration Site-02 Northwest and Central. A Radiological Remedial Objective of 1 picocurie per gram above background levels, not to exceed 2 picocuries per gram total, for radium-226 was established based upon agreement between the Navy's Radiological Affairs Support Office and United States Environmental Protection Agency, Region IX. Background reference area samples were collected in a non-impacted portion of the Parcel E area. Based on these results, radium-226 background levels were established as 0.883 picocurie per gram. The *Final Historical Radiological Assessment, Volume II* (Naval Sea Systems Command, 2004) also identified strontium-90 and cesium-137 as radionuclides of concern for Installation Restoration Site-02. The removal action objectives for these two radioisotopes were 10.8 and 0.113 picocurie per gram, respectively. The removal action objectives for this work is documented in the *Final Basewide Radiological Removal Action, Action Memorandum - Revision 2006* (Tetra Tech EC Inc., 2006). If additional radionuclides were detected during the screening activities conducted during this removal action, the relevant Radiological Remedial Objective established in the *Base-wide Radiological Work Plan* (Tetra Tech FW, Inc. 2005a) for each confirmed radionuclide was adopted for this removal action. The radiological survey, screening, sampling, and post-excavation sampling during this removal action was conducted in accordance with the *Base-wide Radiological Work Plan* (Tetra Tech FW, Inc., 2005a) following guidance from the *Multi-Agency Radiation Survey and Site Investigation Manual* (Department of Defense et al., 2000a) NUREG-1575.

The time-critical removal action was conducted in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act and the National Oil and Hazardous Substances Pollution Contingency Plan. The time-critical removal action was conducted pursuant to the *Final Basewide Radiological Removal Action, Action Memorandum* (Department of the Navy, 2001a). A Project Work Plan (Tetra Tech EC, Inc., 2005a) was prepared and issued to define the approach to conducting field work associated with this removal action (Tetra Tech EC, Inc., 2005a).

The Remedial Action Objectives for this time-critical removal action were to implement the Action Memorandum (Department of the Navy, 2001a) and to protect public health and welfare and the environment by physically removing and disposing of radioactive contaminants that exceeded the radiological remedial objectives, thus preventing potential migration of contaminated material within or outside of the site. The Radiological Remedial Objectives that were adopted were established by the Department of the Navy in consultation with United States Environmental Protection Agency, Region IX. Any remaining non-radioactive (chemical) contamination will be addressed through the Installation Restoration Program process, consistent with Comprehensive Environmental Response, Compensation, and Liability Act and the National Oil and Hazardous Substances Pollution Contingency Plan.

The Remedial Action Objectives were planned to be achieved by excavation and removal of debris and other materials with radioactivity above the Radiological Remedial Objectives within the Installation Restoration Site-02 excavation boundary. The excavation boundary was pre-determined based on previous radiological investigations.

The major field activities associated with the time-critical removal action included clearing of vegetation; in-situ radiological surveys; excavation of soil; debris, drums, and containers with unknown chemical contents; air monitoring; ex-situ radiological screening; removal of groundwater monitoring wells; segregation of contaminated soil and debris; stockpiling of excavated soil and debris; post-excavation confirmation sampling; backfill placement and compaction with screened soils and import materials; site restoration; and waste classification, storage, and disposal.

A grid system was established over the excavation area to track the required radiological surface surveying within the excavation boundary, control and record excavation progress, and assist in the collection of post-excavation samples. The excavation was performed in a series of six-inch or twelve-inch lifts. Radiological instruments were used to perform surface screening prior to removing each lift. The alternating screening and excavating cycle was continued until the excavation reached Bay Mud or the maximum depth of ten feet below ground surface. The top of the Bay Mud, where present, was approximately three to five feet below ground surface. This

depth was pre-determined based on previous radiological investigation. Additionally, each grid was numbered to track the excavation depth and associated sampling.

Upon completion of excavation activities within the area, post-excavation radiological soil sampling and screening was performed to document the radiological status of the bottom surface of the excavation.

Prior to backfilling the excavation area, topographical and geophysical surveys of the sidewalls and excavation bottom were conducted. Geotextile fabric was placed along the excavation bottom and sidewalls as a boundary indicator. Excavated soils determined to be in compliance with the Radiological Remedial Objectives were used to backfill the excavation. Additional fill material was necessary to complete backfilling. Therefore, materials originally from the Bay Area Rapid Transit comprising limited sections of the material screening pads were used to backfill the excavation to 3 feet below ground surface. The final 3 feet of the excavation was backfilled with clean import fill material to provide a barrier and bring the site to final grade.. Since backfill and grading, the Installation Restoration Site-02 Northwest and Central Area is undergoing natural revegetation, with periodic visual inspections performed to ensure appropriate drainage and storm water protection.

The originally estimated volume of soil to be removed at the site was approximately 44,100 cubic yards; however, the final amount excavated was approximately 49,500 cubic yards. The limits of the excavation remained within the planned excavation boundary. The effectiveness of the removal action was established by evaluating the post-excavation bottom and sidewall samples. All samples were below the Radiological Remedial Objectives for strontium-90 and cesium-137. For the systematic grid samples, 155 of 160 samples were below the Radiological Remedial Objectives for radium-226. For the random grid samples, 59 of 63 samples obtained were below the Radiological Remedial Objectives for radium-226. All sidewall samples (29) were below the Radiological Remedial Objectives for radium-226. In addition, of the 9 exceedences described above, the highest radium-226 result was 6.225 picocuries per gram, with the remainder of the results below 3.783 picocuries per gram. Further, 2,342 point sources and pieces of radioactively contaminated debris were removed during the excavation at Installation Restoration Site-02 Northwest and Central. Additionally, no further investigation was made to determine if additional devices would be found below the extent of the investigation.

The Removal Action Objectives for radiological materials were achieved within the pre-determined boundaries of the Installation Restoration Site-02 Northwest and Central excavation.. Any remaining radiological materials at the excavation site are now under a cap of radiologically screened soil, thereby eliminating some of the pathways of exposure to hazardous substances for surrounding populations and ecosystems, at the limit of the excavation. Limited non-radiological chemical contamination encountered during the radiological removal was removed, with the

majority of the excavated and radiologically screened material being used as backfill. Chemical characterization samples were collected from the excavation sidewalls and bottom and from stockpiles representative of discrete depth intervals. This information is available to aid in refining the current understanding of chemical contamination at and adjacent to the site.

Recommendations for actions at and or adjacent to the Installation Restoration Site-02 Northwest and Central area include the following:

- Evaluate all data (both chemical and radiological) collected during and subsequent to removal action activities with respect to the contaminant distribution as presented in the Parcels E and F conceptual site models. This evaluation should include an assessment of remedial options for Installation Restoration Site-02 Northwest and Central and Areas 8, 9, and 10 in Parcel F.
- Continue regular groundwater monitoring to identify and assess the impact of the removal action activities described in this Removal Action Completion Report.
- Complete the disposal of all project-generated soil not used as backfill material.
- Evaluate and implement options for disposition of metal debris, cable, and wood material currently staged and secured as low-level radioactive waste in Parcel E, as appropriate.

1.0 INTRODUCTION

This Removal Action Completion Report (RACR) describes the implementation of a Time-Critical Removal Action (TCRA) undertaken at Installation Restoration (IR) Site-02 Northwest and Central (IR-02) within Parcel E, located at Hunters Point Shipyard (HPS), San Francisco, California (Figure 1-1). The U.S. Department of the Navy (DON), represented by the Base Realignment and Closure (BRAC) Program Management Office (West), Naval Facilities Engineering Command, Southwest Division (NAVFAC SW), and the Radiological Affairs Support Office (RASO), directed this removal action. The TCRA was conducted in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This removal action was performed under Contract Number N68711-98-D-5713 and Contract Task Order (CTO) Number 0072.

Hunters Point Shipyard's operational history and subsequent investigative data indicated that IR-02 is an area with an elevated concentration of radioluminescent devices, debris, and associated contamination. The decision to investigate and remediate sites with localized radiological material is documented in the *Final Basewide Radiological Removal Action Memorandum* (referred to hereinafter as the Action Memorandum [AM]) (DON, 2001a).

This Removal Action Completion Report describes the scope and the specific activities involved in the implementation of the TCRA for IR-02. The TCRA was implemented to limit the human and ecological receptor exposure, and to eliminate the potential threat posed by future migration and/or off-site release of these contaminants. Such a release could occur as a result of erosion, weathering, or seismic events. The major field activities associated with the TCRA included clearing of vegetation; in-situ radiological surveys; excavation of IR-02 debris and associated sediment; ex-situ radiological screening; segregation of contaminated soil and debris; stockpiling of excavated soil and debris; post-excavation confirmation sampling; backfill and site restoration; and waste classification, storage, and disposal.

1.1 OBJECTIVES OF THE TCRA

The remedial action objectives (RAOs) for this TCRA are to implement the AM (DON, 2001a) and to protect public health, welfare, and the environment by physically removing and disposing of radioactive contaminants that exceed the Radiological Remedial Objectives (RROs), thus preventing potential migration of contaminated material within or outside of the site. The Radiological Remedial Objectives that have been adopted were established by the DON in consultation with the U.S. Environmental Protection Agency (EPA). Meeting the specified RROs for the area is the purpose of this TCRA. Residual chemical contamination not addressed during

this removal will be addressed through the Installation Restoration Program process, consistent with CERCLA and the NCP.

The TCRA described in this document is part of a larger overall effort by the DON to address radioactive contamination at HPS. Activities being performed as part of this TCRA were coordinated with remediation activities throughout Parcels E and E-2.

1.2 REPORT ORGANIZATION

This RACR has been structured to provide details on the major aspects of the TCRA at IR-02. It is organized as follows:

- Section 1.0 discusses the objectives of the TCRA, the report organization, and the project timeline.
- Section 2.0 discusses the site description and background, the physical characteristics, previous investigations, the nature and extent of contamination, and a summary of the AM driving this TCRA.
- Section 3.0 discusses pre-excavation activities.
- Section 4.0 discusses excavation activities.
- Section 5.0 discusses post-excavation activities.
- Section 6.0 discusses waste characterization data and disposal and/or recycling of wastes generated during the excavation activities.
- Section 7.0 discusses the radiological data and results.
- Section 8.0 discusses the effectiveness of the removal action.
- Section 9.0 discusses the data quality assurance (QA) and quality control (QC) assessment.
- Section 10.0 discusses community relations activities conducted during the project.
- Section 11.0 contains the report recommendations.
- Section 12.0 contains a list of references.
- Appendix A contains the weather data collected during the project.
- Appendix B contains the kick-off meeting agenda.
- Appendix C contains the well destruction forms.
- Appendix D contains the results of the chemical post-excavation sampling results.
- Appendix E contains the backfill material review and acceptance documentation.
- Appendix F contains the results of the waste data and waste manifests.
- Appendix G contains the results of the radiological post-excavation sampling and gamma scan surveys.

- Appendix H contains the survey reports for the project.
- Appendix I contains pertinent project photos.
- Appendix J contains the field change requests for the project.
- Appendix K contains community relations documents for the project.
- Appendix L contains the validated laboratory data packages for the project.
- Appendix M contains the results of the radiological offsite sample analysis for the project.

1.3 TIMELINE

Site mobilization occurred in April 2005, with excavation activities beginning one month later. Excavation and screening progressed through the remainder of 2005. The final depth of the planned excavation was achieved in September 2006, followed by a series of investigative processes intended to yield additional information about the subsurface of the IR-02 site, potentially applicable to other areas of Parcel E. These processes included excavation of a number of potholes to determine the extent and orientation of the Bay Mud unit and investigate the physical nature of material encountered at the bottom of the planned excavation. In addition, a geophysical survey was completed once backfill operations were sufficient to bridge the groundwater infiltrating the excavation site.

Following the activities described above, backfill operations continued through February 2007. Final grading of the excavation was completed February 2007. The IR-02 excavation site is undergoing natural revegetation, with periodic visual inspections performed to ensure appropriate drainage and storm water protection..